



*The Story of the
Big Ditch*

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The Story of the Big Ditch

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"Give me a blessing. Thou hast given me a south land, give me also springs of water; and he gave her the upper and the nether springs." Achsah the bride, leaving the old home for the new, craved a blessing as well as a gift. Caleb her father had given her as a marriage portion the much coveted south land with its sunny slopes and rich pasture, but without water it was not perfect and she craved that the gift be made a blessing, by the bestowal of springs of water which alone make a south land fruitful.

More than a thousand years have fled since Achsah proffered her request, but still the south lands of the world cry, "Give us water, our golden sunshine and rich soil avail not without the blessing of the upper and the nether

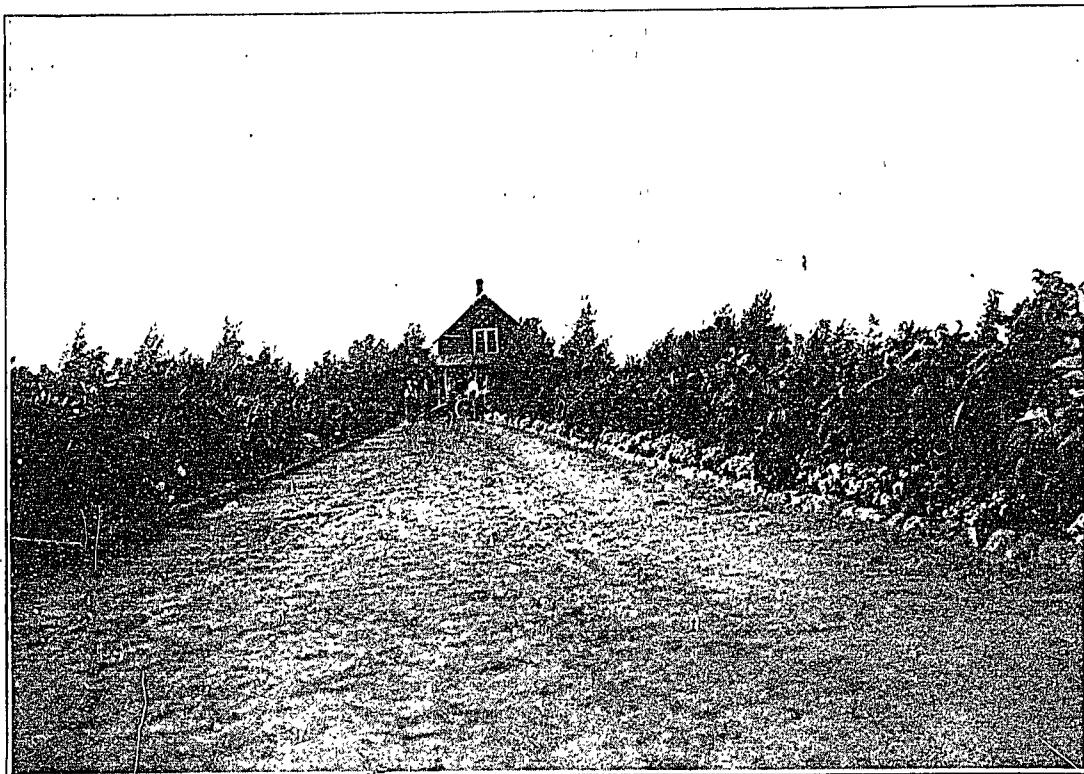


View of One of the Dams

springs." Alberta has a glorious south land stretching mile after mile in gently undulating plains,—"Great spaces washed with sun,"—where in olden days the buffalo roamed and where in the early eighties thousands of horses and cattle fattened on its nutritious "prairie wool." Among the strong riders of the plains in those days of the big round-up and the chuck wagon, was one who had something of the "seer's vision" and he pondered as he rode over that great triangle, between the 4th and 5th Meridians and on either side of the 51st standard parallel, which apexes at the now cities of Calgary, Medicine Hat and Lethbridge. The burden of his thought was, "If only this land could be watered what a glorious thing it would be."

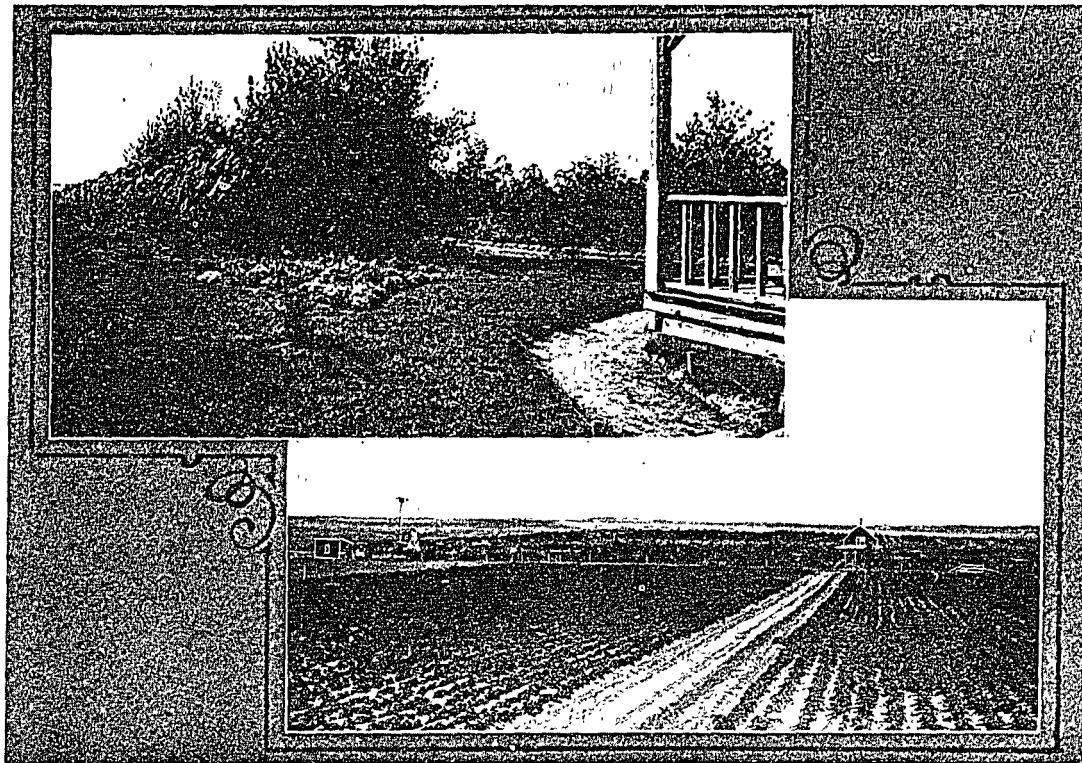
The Dream of the Big Ditch

Far away at the highest point in the Rocky Mountains a little stream, so narrow a child could step across it, strangely, almost mysteriously, divided its



The Bungalow

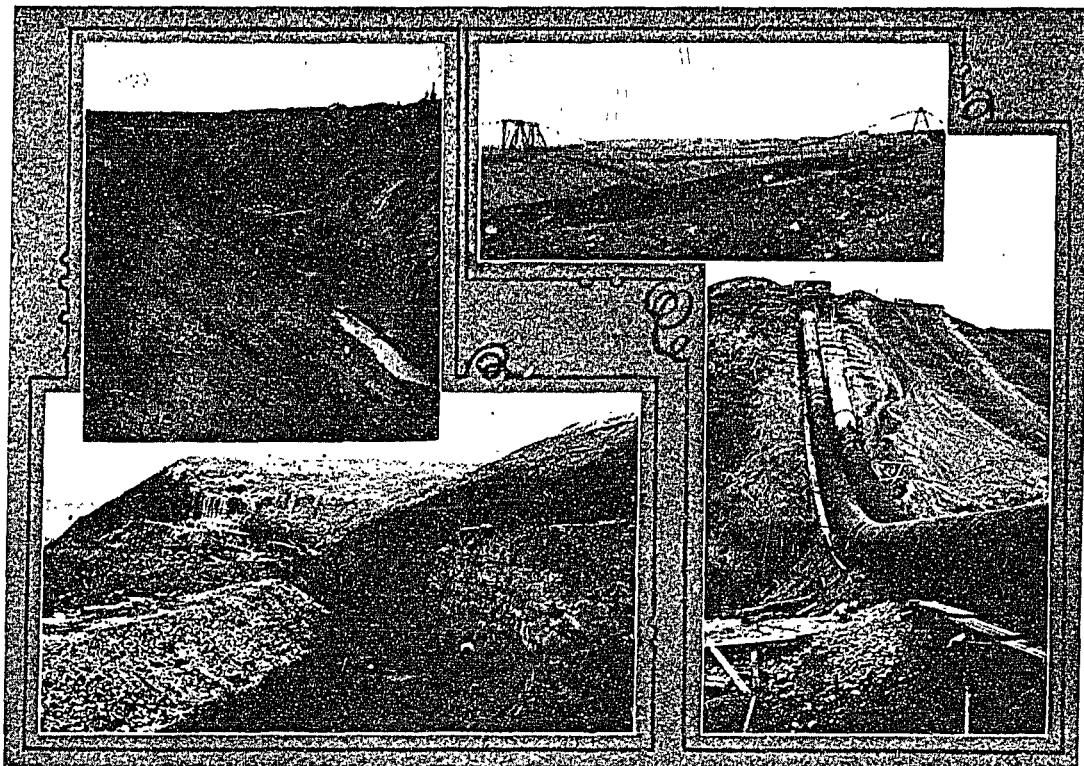
waters, one tiny rivulet flowed downward to the western sea, and the other down the eastern slope to at last find an outlet in Hudson's Bay. As it dashed over the rocks it was fed by a thousand other streams from glaciers and snow-capped peaks; it expanded into lakes and again narrowed into a river flowing into a broad deep channel through a beautiful valley. Ever as the summer suns waxed hot on glacier and mountain peak the volume of water poured through the river's channel at high flood, often overflowing the banks and carrying cattle, horses, trees and sometimes the homes of new settlers in its headlong career. The thoughtful rider of the plains watching the river in flood, thought of the beloved south land yearning for streams to develop its fertility, looked and longed to bring the waste of one to be the salvation of the other, and then and there, the "Dream of the Big Ditch" was born. Between the rushing, often angry river and the waiting plains, were great heights of land, deep valleys, many and great obstructions, but none so great, that in dream at least, they could not be overcome.



Garden at the Bungalow

The Years Between

Great works cannot be undertaken without capital, and capital is shy of the new and little known. The rider of the plains became a man of affairs, he was hither and thither and yon, and the years slipped by, yet the dream never really faded. At last the time seemed ripe; slowly but surely men of capital had come to believe that irrigation was not only possible but profitable for many of the semi-arid sections of the great Province of Alberta. The project took form; finally the rider of the plains had the pleasure of himself laying possibilities of his dream before financial magnates in London, that Mecca of enterprises for the development of new countries. The project was received favorably, a company was formed, 400,000 acres of the south land was purchased, and in 1908 the "Big Ditch" which was to carry the waters of the Bow River 200 miles to the smiling plains, was actually begun. Now this gigantic undertaking is all but completed and it is possible for those who have



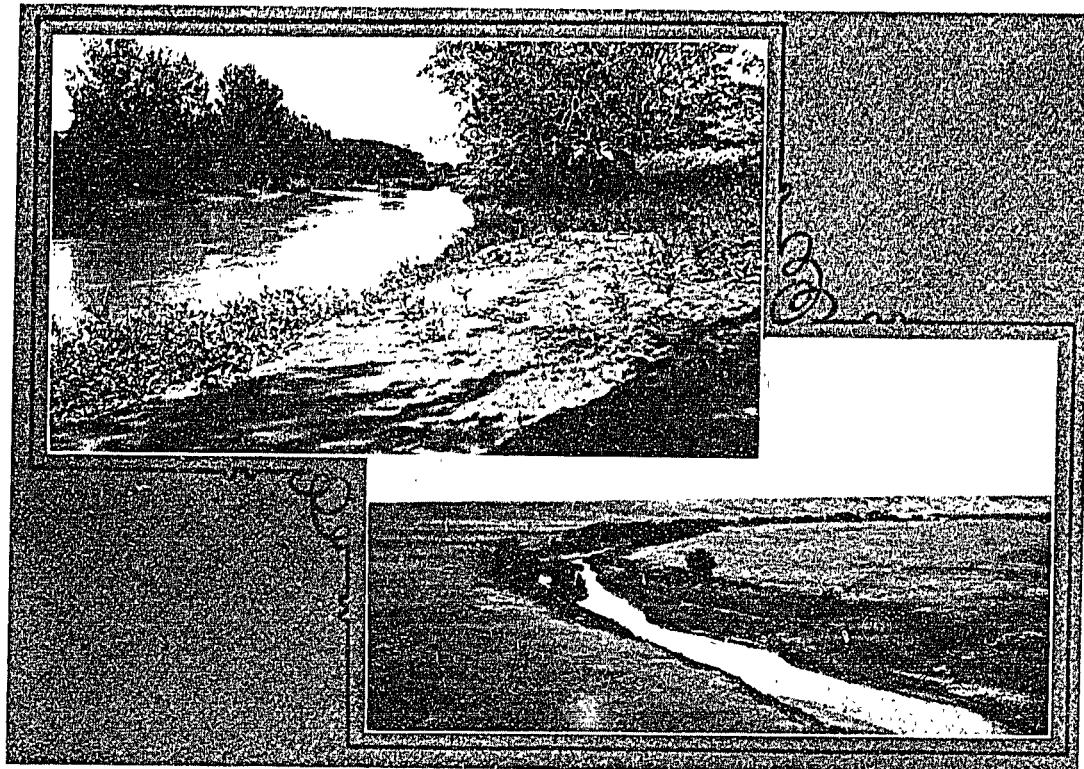
Big Cut
Rock Cut in Canal

Suspension Bridge Across Big Cut
East Arrowwood Syphon

been most closely allied with the work to draw long sighs of relief as they recount the dangers and difficulties overpast.

The Obstacles

Some faint idea of the difficulties is gathered from the fact that all raw materials such as lumber, cement, steel for reinforcement, coal and gasoline for engines, as well as supplies for hundreds of men, had to be hauled from fifteen to forty miles by team, and much of it over a country where there were no roads. Heavy machines, such as graders and steam shovels had to go across virgin prairie. Labor was always scarce, hard to obtain, and often indifferent in quality; sufficient horses were not to be had and mules had to be imported from St. Louis, Missouri. These were the common troubles of large undertakings. The engineering problems were the real trouble and were of great magnitude. Before even the first shovel of dirt was moved, there were costly



Views of the Bow River Near Ronalane

topographical surveys, long and careful inspection of routes until finally Chief Engineer Arthur M. Grace, Mem. Am. Soc. C. E., a man of wide experience in irrigation work, was satisfied that the route selected was the one of all others that would command the largest area of irrigable land. His choice was endorsed by no less distinguished a man than George Gray Anderson, who was retained as Consulting Engineer.

The Intake

This route indicated Johnson's Island in the Bow River as the best point for the intake, although it was 119 miles from the first acre of the Company's land to be irrigated, necessitating the construction of one of the longest feeder canals in America. The point chosen is 40 miles southeast of Calgary. In order to raise the water the necessary 12 feet to carry it along the height of land, a spill dam of concrete was put in across the small channel of the Bow



on the north side of the Island, an earthen dam across the Island and a concrete diversion dam across the main channel. These concrete dams are of the ordinary gravity type and are reinforced longitudinally with steel rails. Construction on the diversion dam across the main channel was carried on under great difficulties. Work was carried on simultaneously from both banks after the intake structure was completed and the sluice gates were in place. The Chief Engineer had instructed the contractors to see that the apron below the sluice gates was completed before any water was turned through the gates, the idea being to reduce the volume of water where the two portions of the dam were being brought together by diverting it through the sluice and intake gates.

Unfortunately, contractors do not always follow instructions and the apron was not constructed in accordance with directions and as a result, as the two portions of the dam approached the meeting point, in the center, there was a considerable wash discovered below the sluice gates and they had to be closed.



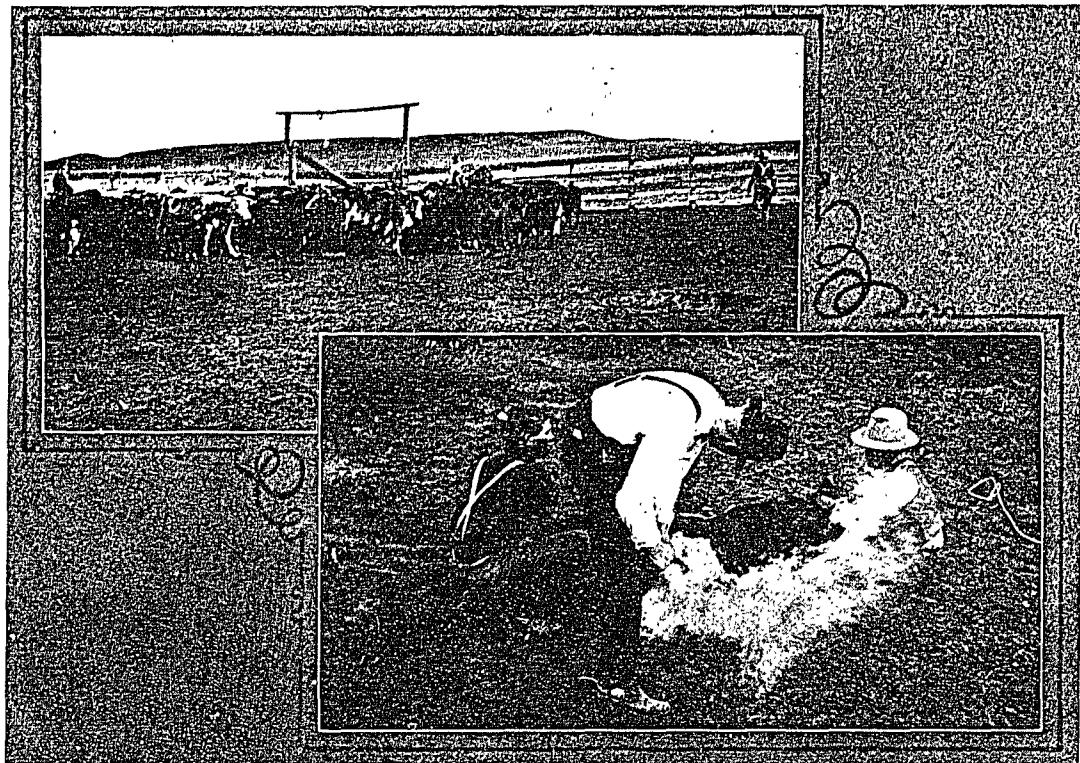
Tree Plantation at the Bungalow

Inasmuch as the greater volume of water could not be disposed of in the manner originally planned, this necessitated the depositing of the concrete for the final closing of the dam by some other method than that of the ordinary wooden form, so the concrete was placed in cement sacks and lowered into place in the boiling, tumbling waters and the construction thus carried above the elevation of the crest of the dam diverted the water over the completed portions of the dam and made it possible to build the concrete moulds round the sacks and deposit the balance of it in the usual manner.

The intake dam has added greatly to the beauty of the river, forming a broad sheet of water across the valley where formerly there were two channels, neither of them very picturesque.

The Big Cut

From the intake the "Big Ditch" follows the bold curves of the hills for five miles northeast,—the hills forming one side of the ditch—to a point where



At the Cow Camp

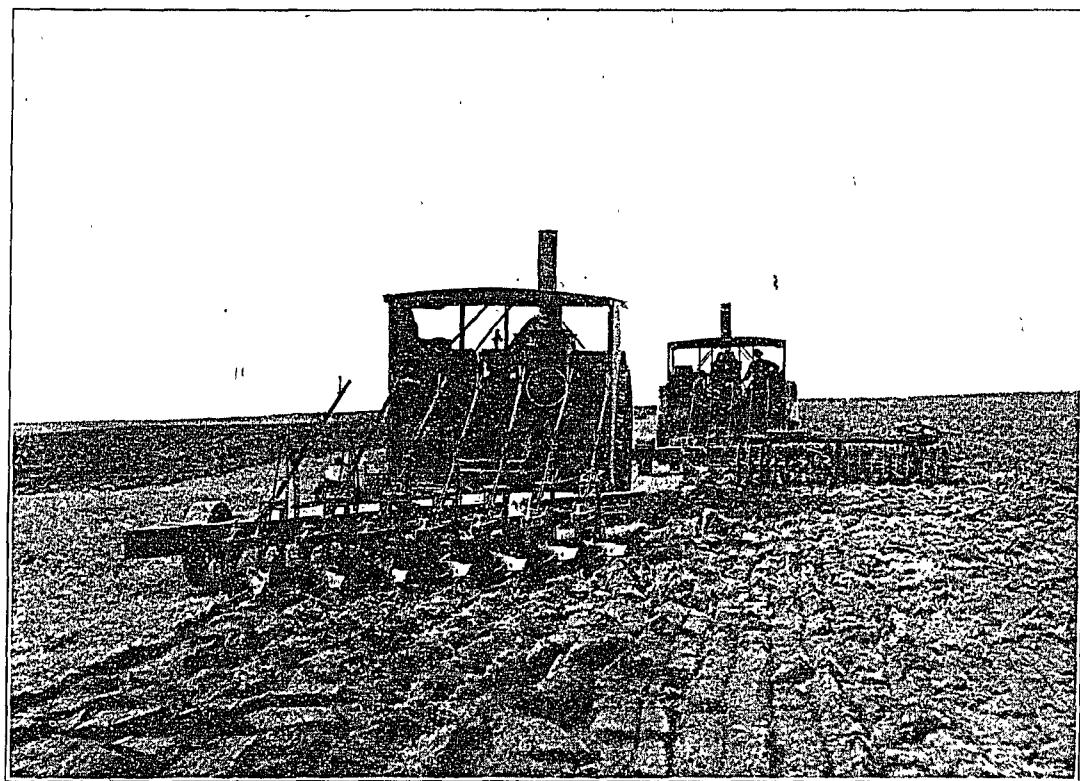
it would seem as if nature had formed a barrier to forever shut the waters from the waiting plains beyond to the south and east. Nevertheless the engineers decided that this was the point of all others where the ditch must twine in order that the water might ultimately command the largest area of the plains, so here the most gigantic bit of the whole project was begun. To carry the water through at proper level it was necessary to make a cut 64 feet deep and one and three-quarters miles long, with some difficult curves. For three long summers the huge steam shovels have toiled on the cut, trains of cars have rattled along, paused by the steam shovels working from either end and received their load,—three bites out of the seemingly endless bank to each little car. A steam shovel on this cut is like a boy with a chunk of hard maple sugar on which he cannot close his teeth. He starts at the bottom and scrapes upward, leaving the track of his teeth and in that way gets a satisfactory mouthful. The steam shovel's chunk of bank is 12 feet high and a



The Old Way—Two or Three Acres Per Day

scrape up give the giant mouthful of a cubic yard of dirt. When the train rattles out of the cut it carries 66 cubic yards of mother earth. In all over 1,500,000 cubic yards have been removed. The removal of the earth was not all of the big cut. Very early in the work it was found that springs and exposure to frost was causing disintegration and sliding of the walls of the cut and a conduit would be necessary to insure an uninterrupted flow of water. This conduit is 22 feet by 15 feet and necessitated the laying of 6,000 cubic yards of concrete reinforced with 1,000,000 pounds of steel. To look down into this cut was to gaze into a sort of inferno, the smoke of the steam shovels and track engines, the rattle of chains, the clank of machinery, and in and through it all scores of men darting to and fro waving signals, clearing tracks and ever and always looking so small in proportion to the task undertaken.

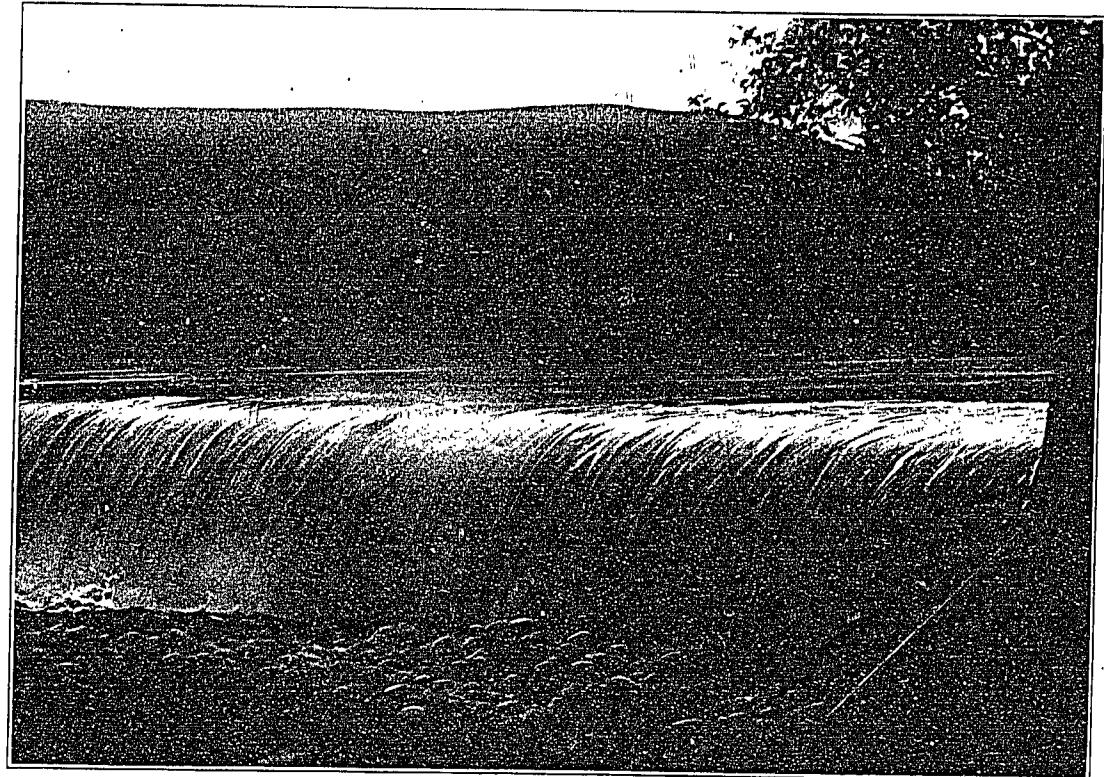
About this cut the camp is a small town, with store houses, work shops, machine shops, piles of coal, sheds of cement, stacks of lumber and the great dining room and bunk houses.



The Modern Way—Twenty to Thirty Acres Per Day

The Arrowwood Creeks

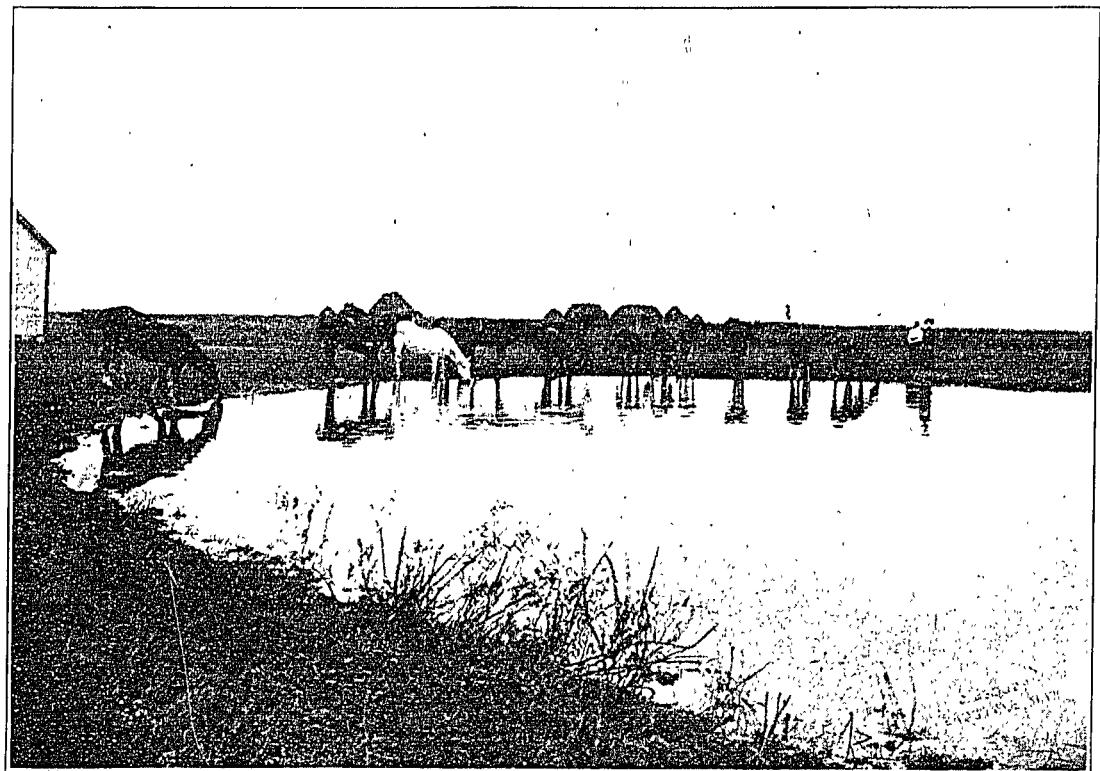
The next difficulty to be overcome in the onward march of the "Big Ditch" was the West Arrowwood and the East Arrowwood Creeks, small streams with high banks. The west branch was overcome by a flume 1,050 feet long and 46 feet above the river. The east branch was a greater undertaking, a flume would not answer and so an inverted syphon was constructed. Standing at an angle and glancing down the valley of East Arrowwood, it looks as if two gigantic pythons had crawled side by side down one bank and up the other and rested with their tails on the lip of the valley on the west bank and their heads on the slightly lower lip of the east bank. In reality, these pythons are twin lines of continuous wood stave pipe each 7 feet 6 inches internal diameter and 1,200 feet long with inlets and outlets of solid concretes, the maximum head is 135 feet. The pipes rest upon wooden cradles.



The Diversion Dam

Lake McGregor

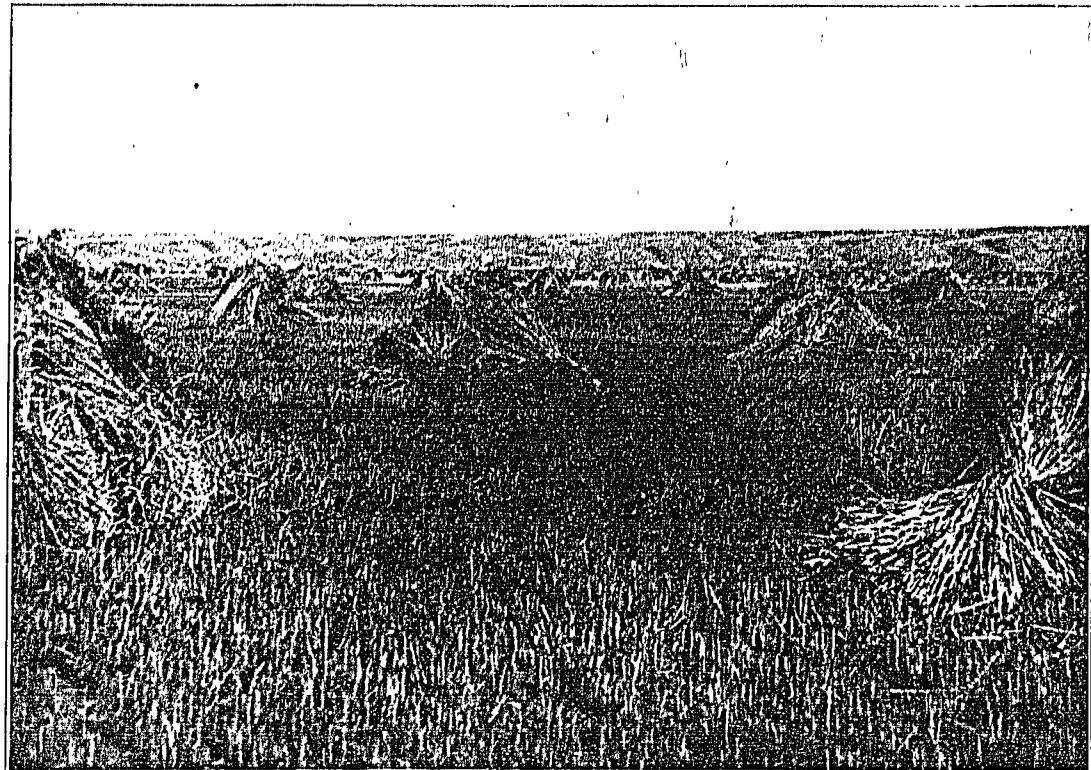
From the mouth of East Arrowwood syphon the "Big Ditch" follows the height of land almost due south to Snake Valley, an ugly name for a beautiful stretch of country which looks as if nature had placed it there for a lake and forgotten to put the water in. For the future it will be a lovely lake 22 miles long and $\frac{1}{2}$ to $2\frac{1}{2}$ miles in width with high banks on the north and east. The lake covers an area of 13,000 acres and is created by constructing a dam at either end of Snake Valley. An engineer's note describes this undertaking as follows: "North Dam 3,000 feet, height 46 feet, 300,000 cubic yards of earth used in construction, inner slope rip rapped and grouted with wall of Cyclopean masonry at toe. South Dam length 1,900 feet, height 40 feet, 115,000 cubic yards of earth. Inner slope rip rapped and grouted, with wall of Cyclopean masonry at toe and line of sheet piling. Outlet structure of reinforced concrete equipped with two Stoney sluice gates, 5x10 feet."



Range Horses

This description conveys little to the lay mind. What are rip rap grouting and Cyclopean masonry? To rip rap a dam is to face it with boulder stone forced into the solid earth wall. Therefore when these two dams 4,900 feet in length and 46 feet in height were faced with boulders, every stone placed by hand, the stones had to be gathered from the surrounding country which seems never to have been well supplied with the article, and now for scores of miles it would be hard to find even a small boulder to heave at a dog. The stone was brought by the cord and the gathering and hauling was a source of revenue which helped many a new settler to get upon his feet.

To grout rip rap is to pour concrete down the slope, while men in long rubber boots stand, their feet braced in the boulders, and with shovels and trowels work the concrete in among the stones and when the interstices are filled, smooth it off and leave it like the plastered wall of a house. Over 300 sacks of cement are used in one day's grouting. The toe of Cyclopean masonry is a yard wide band of concrete poured over giant boulders at the

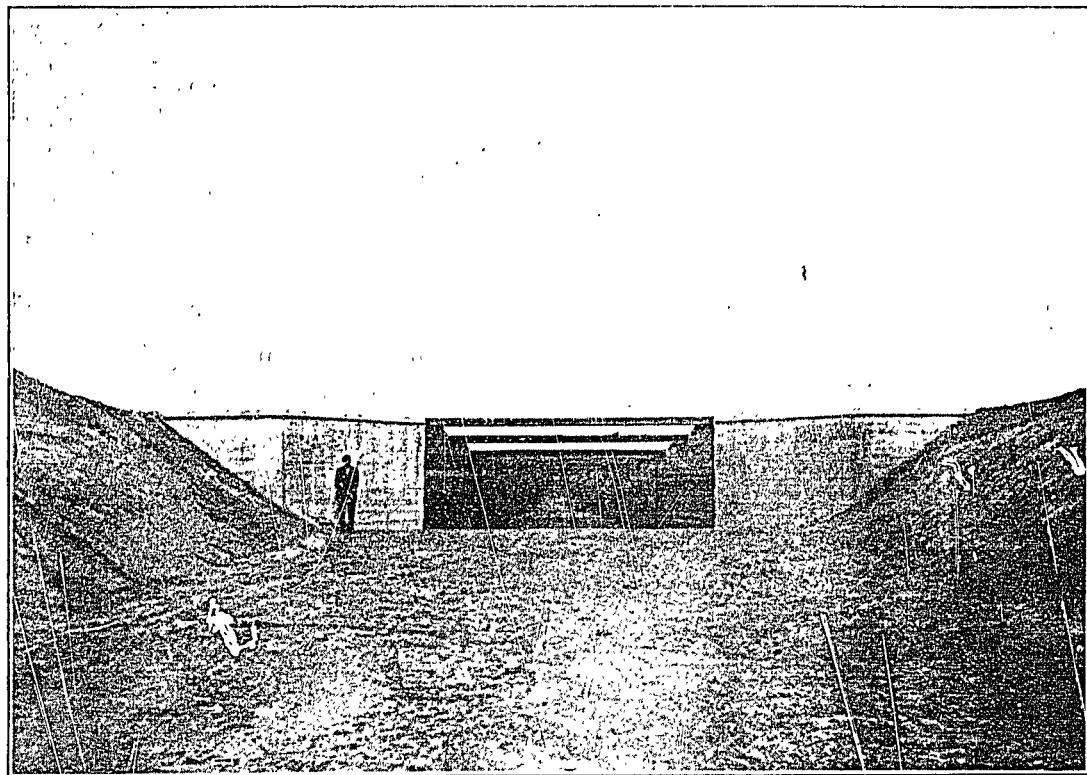


Field of Rye at Home Ranch

bottom of the wall to prevent any possible seepage and at the toe of the south slope where the pressure is greater, this is further guarded by sheet piling driven to depth of 12 feet. This reservoir is the fourth largest irrigation reservoir in the world, and the lake created by these two giant walls is to be known for all time to come as "Lake McGregor," in honor of the man who first dreamed of the "Big Ditch." The lake has a capacity of 360,000 acre feet of water, or 12 inches of water for every acre of land commanded by the irrigation scheme.

The Value of Warm Water

Summer and winter the lake will be full so that should there come a season of unusual cold in the glacier regions, from which the Bow River is fed, there will be sufficient water in the lake to furnish the entire moisture necessary to grow a crop on every acre to which main and laterals reach. But this is not the only special advantage of the big reservoir. The streams from



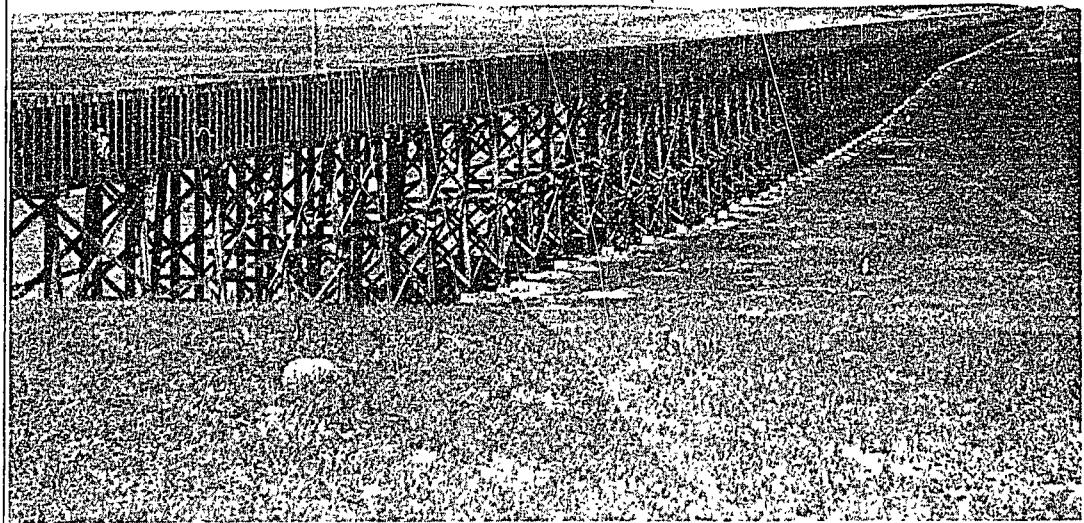
Entrance to Mile Wide Valley Flume

glaciers are very cold, so cold that even in mid-summer few can stand more than a momentary bath in a mountain stream. To irrigate growing crops with water at that temperature would be to check their growth at a time where even hours count. But the water stored in Lake McGregor with its depth of not over 30 feet and its broad expanse to the sun will be warmed until it will be as grateful and stimulating as a summer shower to the roots of growing crops.

The capacity of the "Big Ditch" up to Lake McGregor will be 62,100 cubic feet of water passing a given point every minute in the 24 hours. Out of Lake McGregor the capacity will be 84,000 feet per minute, if such a volume is ever necessary.

The Little Bow

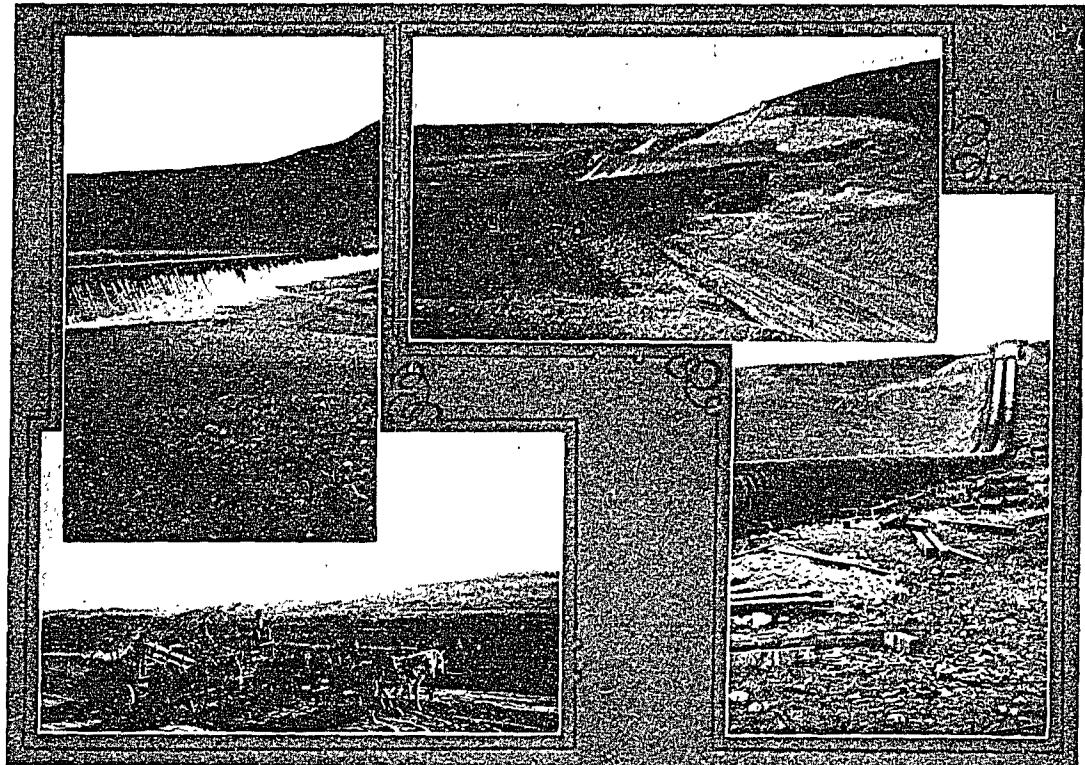
Leaving Lake McGregor and following the height of land, the "Big Ditch" encountered the most serious difficulty apart from the "Big Cut," which



Mile Wide Valley Flume

menaced the entire route. To secure the proper elevation the canal had literally to be hung up on the precipitous cut banks of the Little Bow River. This entailed the excavation of 200,000 cubic yards of solid rock in a distance of nine miles. The aggregate cost of one mile of this work was \$120,000. Nor was this all, to protect the canal from possible washouts it was necessary to construct four reinforced concrete waste ways and one quarter of a mile of concrete lined ditch.

Leaving the Little Bow River the "Big Ditch" turns north for a short distance and then directly east. The fall of the country here is so abrupt as to make drops or falls necessary, and nine drops, with a total fall of 142 feet permit of the maintenance of an easy canal gradient. These drops are of reinforced concrete for the most part of the trapezoidal weir type, and though expensive to construct, are not without their compensating value. Quite apart from conveying the water of the "Big Ditch" at a proper gradient, the fall of 142 feet makes possible the immediate development of 15,000 horsepower, and



Dam Across Bow River
Grading Machine

View of Canal

Bow River Syphon

2,000 horsepower of this will at once be utilized for pumping water onto land which cannot be reached by the gravity system, thus increasing the irrigable area by 20,000 acres.

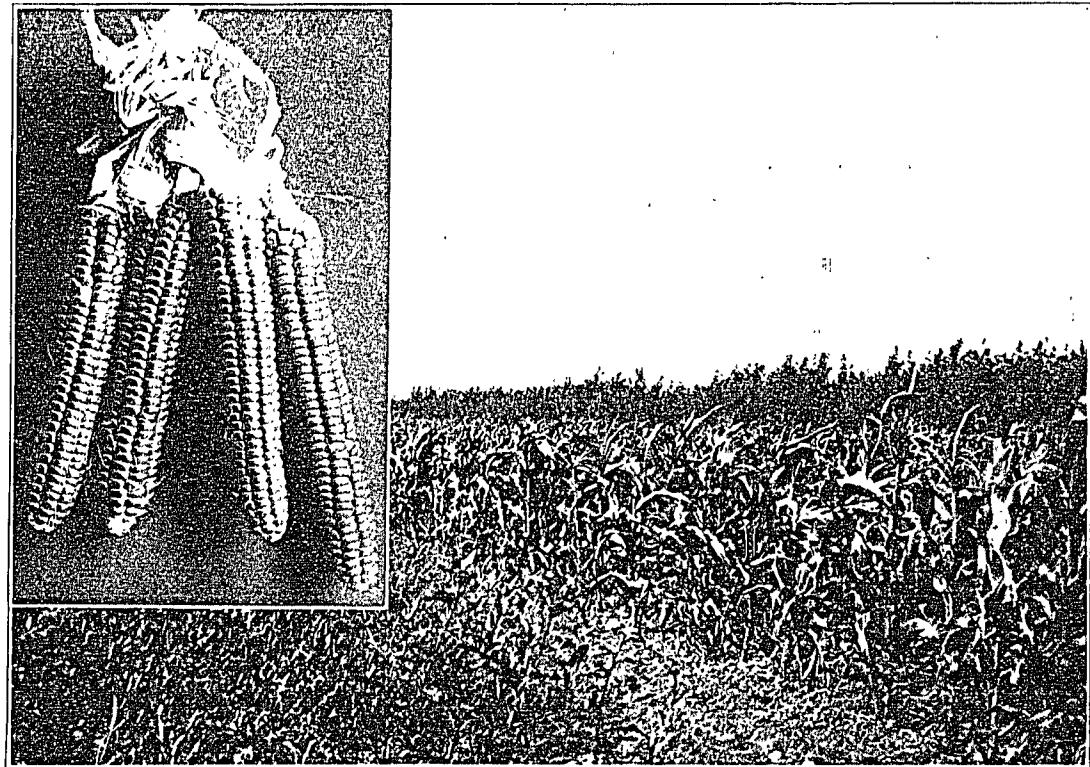
Mile Wide Valley

The next obstacle in the path of the "Eig Ditch" was a valley a mile wide. Across this a flume was constructed 4,860 feet long and 45 feet high. To construct this flume it was necessary to bring by team 40 miles, 1,800,000 feet board measure of British Columbia fir; 20 tons of bolts and washers, 350 kegs of spikes, 1,500 barrels of cement. One thousand concrete pedestals support the flume, and its intake and outlet are giant structures of reinforced concrete. Through this flume the water flows at the rate of 72,000 cubic feet per minute.

Bow River Syphon

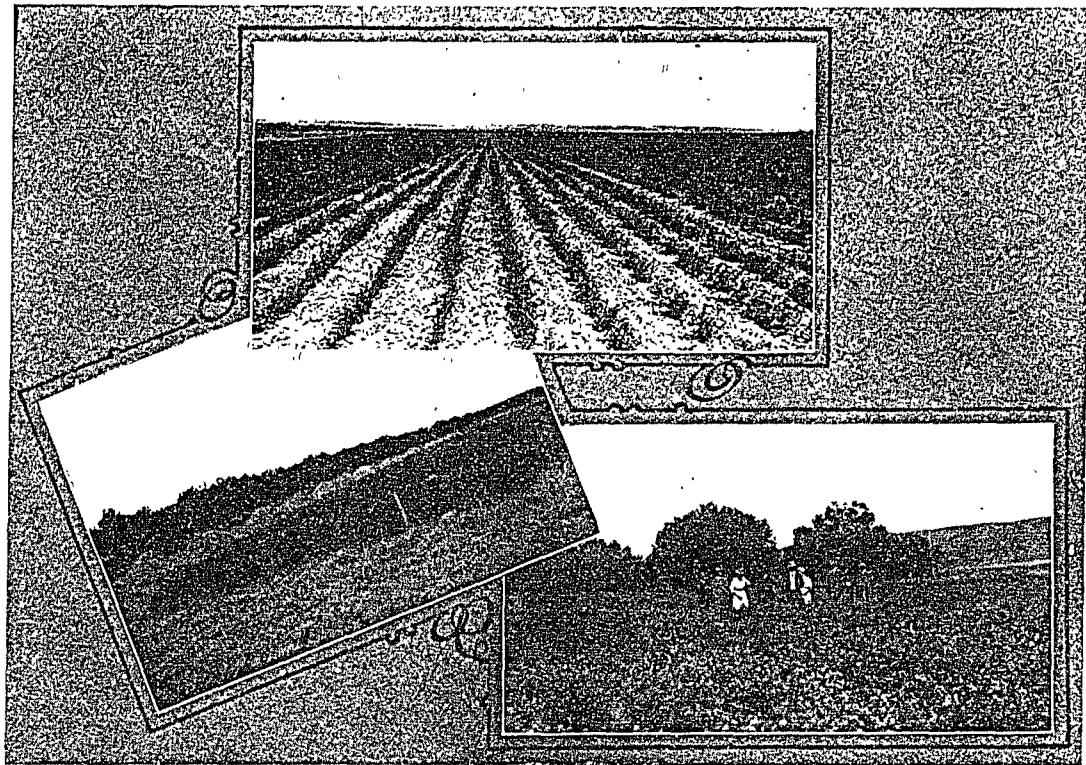
The last great work on the "Big Ditch" is the Bow River syphon.

At the intake it was necessary to raise the waters of the river 12 feet in



Corn Field and Sample of Corn

order to carry them to the height of land, but when, after hundreds of miles of wandering, the "Big Ditch" again met the Bow River, near Prairie Island, that famous landmark of the old cattle days, it was nearly 200 feet above the stream, so once more a syphon was necessary. This syphon, 6,550 feet of continuous wood stave pipe, carries the water across the river on five 120-foot riveted steel spans on concrete piers and with heavy frame and pile trestle approaches. This syphon has an internal diameter of 8 feet, the water goes through with a head of 186 feet and to withstand this the pipe is banded with iron $\frac{1}{2}$ and $\frac{3}{4}$ inch thick, these bands throughout the entire 6,550 feet are never more than 9 inches apart and where the pressure is greatest are only $2\frac{1}{8}$ inches apart. The bridge on which this syphon rests, will be a public highway and in addition will be strong enough to carry the heaviest interurban electric car. The intake of this syphon is controlled by gates and the capacity is 3,600 cubic feet per minute.

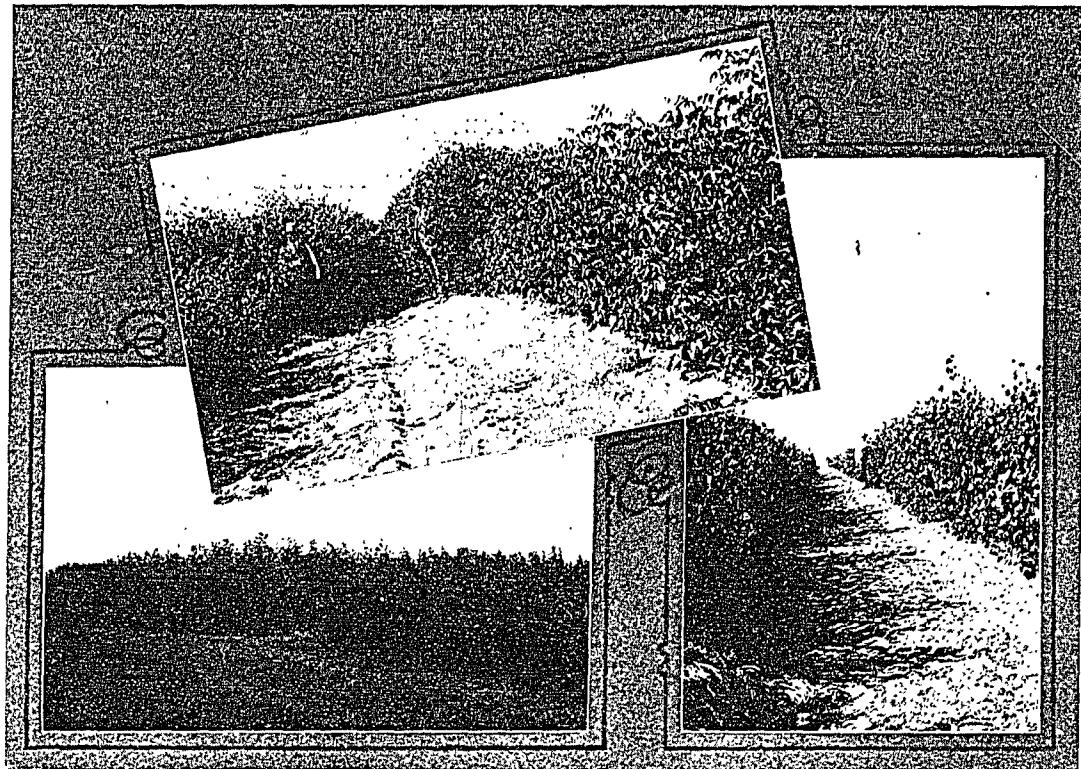


Alfalfa Fields

In addition to Lake McGregor, there is a reservoir in the Suffield district, with a capacity of 35,000 acre feet and various regulating and protecting reservoirs are scattered over the tract. In fact, all the science of modern irrigation engineering has been brought to bear on this great project.

The Dream Came True

This is the story of the building of the "Big Ditch," the story of what that ditch will do for the Canadian west is yet to come. As the work progressed the project broadened and developed, a railway was found to be essential and a charter was secured, but later the Canadian Pacific Railway solicited for the construction of the line and it is now well under way. There will be eight stations on the Company's property, chief of these will be Ronaiane, named after Major General Sir Ronald Lane, president of the Company. This townsite is situated on a beautiful plateau of the Bow River and from its inception will be supplied with natural gas, the whole of the southern portion of the Com-



Russian Poplars, Three Years from Seed, Seven Feet
High, Grown Without Irrigation

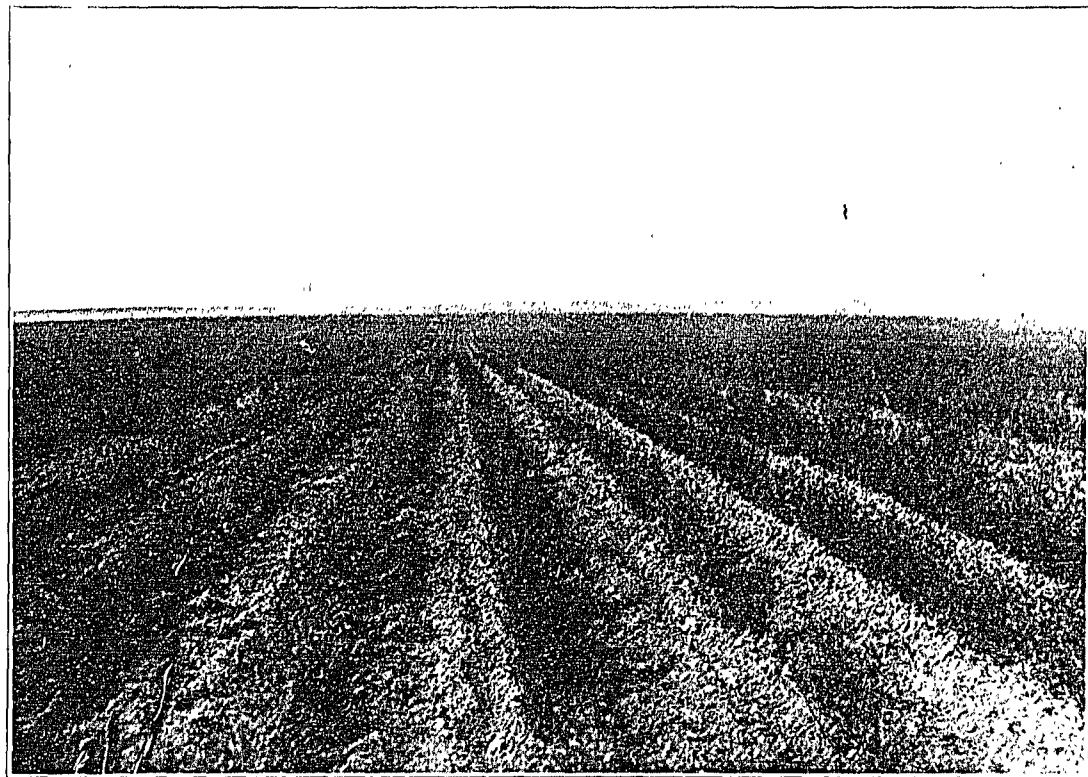
Cottonwood Hedge,
Third Season

pany's holdings being included in the greatest natural gas field of the world.

The land to be watered by the "Big Ditch" and its laterals is a rich brown loam with a good clay subsoil. Even with the very limited natural rainfall it has given marvelous evidence of its productive possibilities.

Though it is a treeless plain, almost every tree common to the northern hemisphere has been tried in the experimental plantation of the Company at the Bungalow and is doing well. All the cereal crops flourish, corn and alfalfa have yielded bumper crops, watermelons and tomatoes ripen readily in the open, small fruits, plums and some varieties of apples have all been successfully produced. With an abundant supply of water, under proper control, the possibilities of the region are almost beyond the scope of the imagination.

The blessing of the upper and the nether springs has in very truth come to the south land of Alberta because one man saw a vision and found another, with scientific knowledge, to say that the vision was true.



Showing Marvelous Productiveness of the Soil

